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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/884,336	06/19/2001	Darren Kerr	112025-0170	4795

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EXAMINER	
MILLS, DONALD L	

ART UNIT	PAPER NUMBER
2616	

DATE MAILED: 09/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/884,336	KERR ET AL.	
	Examiner	Art Unit	
	Donald L. Mills	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 August 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9,12-14,17-19,21,22 and 24-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *7-9,12-14 and 24-34* is/are allowed.

6)☒ Claim(s) *1-6,17-19,21 and 22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-6, 21, and 22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 1, 21, and 22, the claims specifies *calculating when a queue is next eligible and storing event notifications* (For example, see claim 1, lines 10-13.) However, the relationship between the time when a "queue is eligible for servicing" and the "event notifications" are unclear from the context of the claim. It is unclear from the context of the claim whether the "event notifications" represent the "next eligible" period for transmission or some other value. Therefore, the term "event notifications" is rendered indefinite from the context of the claim. Further explanation and clarification is requested.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-4, 6, 17-19, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. (US 6,408,005 B1), hereinafter referred to as Fan, in view of Varghese et al. ("Hashed and Hierarchical Timing Wheels: Efficient Data Structures for Implementing a Timer Facility,") hereinafter referred to as Varghese.

Regarding claims 1 and 21, Fan discloses a dynamic rate control scheduler for ATM networks, which comprises:

Assigning committed information bit rate and excess information bit rate bandwidth values per queue, along with a shaped maximum bit rate per media link (Referring to Figure 6, the DRC distributes bandwidth to support minimum guaranteed rate per stream and distributes any unused bandwidth to users based upon criteria. See column 8, lines 10-17.)

Uniformly scaling the EIR bandwidths of all queues sharing a media link so that the sum of all scaled EIR bandwidths equals an available bandwidth of the shaped media link (Referring to Figure 6, the DRC distributes bandwidth any unused bandwidth to users based upon weights assigned to the streams. The DRC utilizes a time wheel data structure implemented with each bin in the time wheel pointing to four linked lists, one for each priority level, of VC identifiers whose timestamps correspond to the bin label. During each time slot, the current time CT advances to point to the next bin. See column 8, lines 17-18 and column 18, lines 30-35.)

Calculating when the queue is next eligible for servicing (Referring to Figure 8, the queue activity is determined to select for servicing. See column 16, lines 6-9.)

Storing event notifications in a timing wheel, each event notification having a media link, and a priority, the event notifications triggered when a queue is eligible for serving (Referring to

Figure 8, timestamps are stored regarding the queue times for servicing in a timing wheel with priority level and VC identifiers. See column 16, lines 40-50.)

Fan does not disclose *each event notification having a hash entry identifying a queue.*

Varghese teaches hashed timing wheels, which hashes the address value to yield an index value when memory is limited (See page 828, column 2, paragraph 1.)

It would have been obvious to one of ordinary skill in the art at the time of the invention to implement the hashing scheme of Varghese in the system of Fan. One of ordinary skill in the art would have been motivated to do so in order to improve cell scheduling in which the timing wheel comprising a large number of entries which compromises system memory as taught by Varghese.

Regarding claim 2, the primary reference further teaches *wherein the step of storing comprises the step of providing a timing wheel having a plurality of fields per time slot, wherein the fields represent different service priorities of queues* (Referring to Figure 8, a time wheel data structure is implemented with each bin in the time wheel pointing to four linked lists, one for each priority level, of VC identifiers whose timestamps correspond to the bin label. See column 18, lines 30-33.)

Regarding claim 3, the primary reference further teaches *wherein the step of providing a timing wheel comprises the step of configuring pointers to the queues to enable early forwarding of the packets to thereby obviate overhead incurred when searching the timing wheel for other references to the packets* (Referring to Figure 8, a time wheel data structure is implemented with each bin in the time wheel pointing to four linked lists, one for each priority level, of VC

identifiers whose timestamps correspond to the bin label. During each time slot, the current time CT advances to point to the next bin. See column 18, lines 30-35.)

Regarding claim 4, the primary reference further teaches *wherein the step of providing a timing wheel further comprises organizing the timing wheel as a contiguous array of time slots containing pointers to linked lists* (Referring to Figure 8, a time wheel data structure is implemented with each bin in the time wheel pointing to four linked lists, one for each priority level, of VC identifiers whose timestamps correspond to the bin label. During each time slot, the current time CT advances to point to the next bin. See column 18, lines 30-35.)

Regarding claim 5 as explained in the rejection of claim 1, Fan discloses all of the claim limitations of claim 1 (parent claim).

Fan does not expressly disclose *wherein the contiguous array is a hash array and wherein the linked lists are hash lists.*

However, Fan teaches a time wheel data structure is implemented with each bin in the time wheel pointing to four linked lists, one for each priority level) of VC identifiers whose timestamps correspond to the bin label. During each time slot, the current time CT advances to point to the next bin (See column 18, lines 30-35.) Varghese teaches hashed timing wheels, which hashes the address value to yield an index value when memory is limited (See page 828, column 2, paragraph 1.)

It would have been obvious to one of ordinary skill in the art at the time of the invention to implement the bins of Fan's timing wheel as a hash array and the linked lists as hash lists. One of ordinary skill in the art would have been motivated to do so in order to improve the

efficiency of the timing wheel by minimizing search time through the tens of thousands of VCs as taught by Fan (See column 18, lines 26-27.)

Regarding claim 6, the primary reference further teaches *wherein the step of providing a timing wheel further comprises organizing the timing wheel as a descriptor ring having a plurality of per-time-slot queues* (Referring to Figure 8, a time wheel data structure is implemented with each bin in the time wheel pointing to four linked lists, one for each priority level, of VC identifiers whose timestamps correspond to the bin label, logically equivalent to a descriptor ring. During each time slot, the current time CT advances to point to the next bin. See column 18, lines 30-35.)

Regarding claim 17, Fan discloses a dynamic rate control scheduler for ATM networks, which comprises:

Notifying a queue scheduler when each packet is forwarded to a queue (Referring to Figure 6, a given queue is scheduled when the queue is empty and a new cell arrives to the queue, inherently requiring notification of scheduler in order to process the packet. See column 16, lines 7-9;)

Determining if the queue is using a committed information bit rate and if the queue is using an excess information bit rate (Referring to Figure 6, a given queue is scheduled when the queue is empty and a new cell arrives to the queue (committed information bit rate and excess information bit rate). See column 16, lines 7-9;)

If the queue is not using the CIR, making use of the CIR and including such use in calculated aggregate CIR bandwidth for a media link (Referring to Figure 6, if the measured QoS exceeds the target bandwidth, some of the bandwidth is taken away form the stream and

made available to other streams which are in need of bandwidth including empty queues. See column 21, lines 16-20;)

If the queue is using the CIR, making use of the EIR and including such use in a calculated aggregate EIR bandwidth for the media link (Referring to Figure 6, if the measured QoS falls below the target QoS, when queues with data for transmission are being serviced, more bandwidth is allocated to the stream based on the ratio of its perceived QoS to its target QoS. See column 21, lines 65-67 and column 22, lines 1-5;) *and*

Calculating an EIR scale factor of the media link (Referring to Figure 6, if the measured QoS falls below the target QoS, more bandwidth is allocated to the stream based on the ratio of its perceived QoS to its target QoS. See column 21, lines 65-67 and column 22, lines 1-5.)

Regarding claim 18, the primary reference further teaches the method further comprising:

Retrieving a queue descriptor from the timing wheel, wherein the queue descriptor includes a queue index, a media link interface, and a priority value; comparing a calculated link VTP timestamp of a media link queue with a current real time and burst value to ensure that collisions between an eligible queue and other queues do not cause the media link queue to exceed a configurable limit; if the media link queue does not exceed the configurable limit, issuing a dequeue command to the queuing logic for the eligible queue; in response to the command, dequeueing a packet from the eligible queue; returning a length of the dequeued packet as dequeue status to the queue scheduler; and if the queue length is non-zero, sending the dequeued packet to a media controller for loading into the media link queue (Referring to Figure 6, a mechanism is provided whereby a queue is scheduled at its minimum guaranteed rate if its associated timestamp falls behind current time by a designated amount. Scheduling a queue at

its minimum guaranteed rate allows its timestamp to 'catch up' with the current time clock, by slowing down the rate at which the queue is being scheduled. See column 16, lines 40-50. Further, timestamps are stored regarding the queue times for servicing in a timing wheel with priority level and VC identifiers, logically equivalent to hash entries since they act merely as identifiers. See column 16, lines 40-50.))

Regarding claim 19, the primary reference further teaches the method further comprising:

Periodically sending depth threshold status of the media link queue to the queue scheduler; if the depth threshold status indicates that there are more bits in the media link queue than the link VTP timestamp represents, incrementing the link VTP timestamp; correlating the dequeue status with the issued dequeue command; If a dequeued byte count is non-zero, marking the queue as eligible for servicing; if the dequeued byte count is zero, deactivating one of the CIR and EIR of the queue; and decrementing one of the CIR and EIR aggregate bandwidths of the link (Referring to Figure 6, if the measured QoS exceeds the target bandwidth, some of the bandwidth is taken away form the stream and made available to other streams which are in need of bandwidth. See column 21, lines 16-20.)

Regarding claim 22, the primary reference further teaches *storing event notifications for the same queue at a first time slot and a second time slot, where the second time slot is further in the future than the first time slot, the event notification at the second time indicates a higher priority then the event notification at the first time slot* (Referring to Figure 8, the time wheel data structure is implemented with each bin in the time wheel pointing to four linked lists, one for each priority level, of VC identifiers whose timestamps correspond to the bin label. During

each time slot, the current time CT advances to point to the next bin, which comprises a higher priority. See column 18, lines 30-35.)

Allowable Subject Matter

5. Claims 7-9, 12-14, and 24-34 are allowed.

Response to Arguments

6. Applicant's arguments with respect to claims 1-6, 17-19, 21, and 22 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donald L. Mills whose telephone number is 571-272-3094. The examiner can normally be reached on 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Seema Rao can be reached on 571-272-3174. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Donald L Mills
DLM
September 3, 2006

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